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NOVEMBER 1997 VOLUME 7, NUMBER 6

ARMOR AND ARTILLERY EQUIPMENT AND  
WARFARE OF THE 20TH CENTURY AND  
BEYOND



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(1) Allied Forces

## STOP PRESSES!!!

Darlington Productions is working on information and photos on the newest Russian tank recently unveiled — the Black Eagle. Reported to have a typical Russian-style hull and chassis with a more western looking turret. This comes at the same time as the showing of a T-55-based armored personnel carrier by the Russians. Hopefully more information in the next issue.

## ON THE COVERS

### FRONT

A HMMWV-mounted General Dynamics Armament System's GAU-19/A after "wasting" a target at the Maquatra Firing Range in the United Arab Emirates. Photo by Jeff McKAUGHAN.

### BACK

TOP LEFT: On patrol at the embassy housing complex in Tirana, Albania is this .50 cal. FAV gun jeep. Clearly shown are the fender extensions, the wider tires (including the racing rims), and the front fender stowage box. You can see a difference in the size of the rear sideplate, which is larger than the one in the photo on page 4. Finally, you can see the tripod for dismantling the machine gun. Photo by SGT Mark D. Oliva.

TOP RIGHT: THE T-34 Model 1941 in the Ordnance Museum's restoration shop. Photo by Stephen Sewell.

MIDDLE: The Meerkat, lead vehicle in the U.S. Interim Vehicle Mounted Mine Detection System, shown here during a demonstration in South Africa where the vehicle operator has detected a mine and placed a marker for the removal team. Photo by Jeff McKAUGHAN.

BOTTOM: The Israeli modified Sherman carrying the Shrike missile. Note this vehicle is missing the travel lock from the front glacis plate, although the mounting points are there. Photo by Marsh Gelbart.



# *Fast Attack Vehicle*

## *Marines Make It Happen!*

**Albania, Liberia, Zaire . . . Where MEU-SOC goes, so goes the FAV**

By  
Jeff McKaughan

Taking light utility vehicles and arming them to the teeth is not a new concept to most of today's armies. Probably the most recognizable early examples are the SAS and LRDG vehicles of WWII. In more modern times the basic concept has evolved into the Fast Attack Vehicle (FAV).

Typically in service with special forces-type units, many of the FAVs look like overdeveloped dune buggies. Built around a tubular skeleton, these vehicles are designed for speed and agility in order to perform a reconnaissance and deep penetration opera-

tion.

The U.S. Marine Corps have deployed their version of the FAV but in this case they have made do with a warrior from the past to do the things that no other FAV to date can do. They have designed a FAV built around the aging M151 Mutt. All east coast-based Marine Expeditionary Units — Special Operations Capable (MEU-SOC) are equipped with the M151 FAVs.

The M151 Military Utility Tactical Truck (Mutt) went to series production in 1960 and continued through 1988. Produced in a variety of versions, including some armed, the Mutt served the role of light utility until the advent of the HMMWV.

The 26th MEU-SOC have eleven such

vehicles in their inventory. In an interview with LT COL Scott Moore, commanding officer of the 26th's 1/8 Battalion Landing Team, he told JoMO that until something better comes along, this FAV is best suited for their needs.

The basic Mutt remains the same with modifications only to key elements of the vehicle. For example, the engine is the same. This means that just about any Marine with a basic knowledge of car maintenance can work on it. The engine is very simple and easy to

*A FAV being loaded onto a CH-53. Note the rubber fender extensions, roll bars, and the grill shutters. Photo by Gunnery Sergeant Tim Shearer.*







*Participating in Exercise Island Thunder '97, this FAV lacks the fender extensions and does not have the grill protection shutters shown on the vehicle on page 4. Photo by SGT. Mark D. Oliva.*

maintain, which also helps when deployed on ships at sea or in tactical situations when a maintenance shop is not handy.

The suspension is only slightly modified with the changes found mainly in the frontend. The standard tires have been replaced with commercially available wider wheels and tires. As the new tires stick out beyond the width of the Mutt's fenders, rubber mud guards were added.

Except for armament, wire stowage racks, rear side shields, and roll bars round out the obvious changes to the Mutt.

There are three versions of the FAV. The basic gun vehicle, armed with an M2HB .50 cal. machine gun; a TOW launcher with four rounds (one in the tube and three in a ready rack on the hood), and a section commander's vehicle with an M416 trailer (the only version with an installed radio, the others rely on hand-carried sets).

The Marines have been deployed their vehicles a number of times over the past few years in potentially dangerous situations. In Liberia and Sierra Leone as internal civil strife threaten the safety of the U.S. embassy

and staff, the Marines were called in for added security. The M151 FAV, demonstrated one of its most important features — two of them will fit in a CH-53 helicopter. This gives the Marines tactical mobility and firepower as soon as the ramp goes down.

When Albania started to implode and other countries went to the aid of their citizens there, the 26th deployed two of the seven FAVs they actually had with them on the ships. While the vehicles did come under fire on occasion, they never returned fire due to strict rules of engagement.

However, on March 14, 1997, while the Ground Combat Element of the 1/8 was providing security at the several-acre U.S. Embassy compound, a van load of armed Albanians pulled up closely alongside the wire fence around the perimeter. While they took no hostile action, they were a potential threat. COL Moore ordered one of the FAVs to pull down in front of the van and confront the occupants. With the FAV's .50 cal. machine gun only about five feet from the van, and pointed right at them, they got the message and left without further adieu.

FAVs were also pre-positioned in Brazzaville, across the river from Kinsaha in the event that the Marines were needed to protect U.S. interests if the situation there warranted.

The M151 FAVs have their warts. The design and vehicles are getting rather old and maintenance can be a problem. But they are still the vehicle of choice as other vehicle available to the Marines will fit inside a CH-53 and a sling-loaded vehicle into a hostile environment is not an preferred option. They also like the vehicle-style design offered by the M151, compared to the dune buggy-style, as it give them more load-carrying options.

The Marines have taken a piece of reliable hardware and adapted it to their mission-specific needs proving once again that, when called on, the Marines make it happen.

Thanks to LT COL Scott Moore and LT Bill Darrenkamp of the U.S. Marine Corps for their assistance with this article.

*NOTE: JoMO will look at several replacement options the Marines are considering in an upcoming issue.*



# FROM SHERMAN TANK

# TO SHRIKE LAUNCHER

By  
Marsh Gelbart

The Israelis have long been known for their ability to upgrade, renovate, and revitalize armored vehicles. The upgrade of the Centurion to the Sho't and the M48/M60 series to the Magach 7 are well known. What is not commonly perceived is at the end of their useful lives, upgraded Israeli MBTs are seldom discarded but are given new roles very different from those previously conceived of by their original manufacturers.

Sherman tanks were adopted for many functions after their usefulness as gun tanks faded. The conversion of the Sherman into the Soltam L33 155 mm self-propelled gun and as armored ambulances is well documented. Less celebrated is the use of Shermans as missile carriers. The most photographed of these is the TMS 290 mm Artillery Rocket System. This turretless Sherman mounted 290 mm rockets in a four-round frame and was in Israeli service for several years before becoming public knowledge.

A less familiar hybrid armored fighting vehicle is the Sherman Shrike missile carrier. The tank hull which usually provided the basis for the Shrike launcher appears to be that of the M51 HV Super Sherman fitted with HVSS suspension. This "Black program" was one that came to light through accident three years ago.

On a visit to the Israeli airforce museum at Hatzetim in the Negev desert, several of these vehicles were found dumped amongst

derelict aircraft, apparently abandoned on the fringes of the museum. On the two Shermans photographed, the missile on one is more or less intact, the other missing its nose cone.

So what were the purposes of these armored fighting vehicles which had remained secret for some twenty-one years? In the October 1973 war, Israeli aircraft had suffered severe losses to Arab air defences. Surface-to-air missiles, (SAMs), had proved effective in limiting the effectiveness of tactical air power. In particular the SAM 6 had forced Israeli aircraft to operate at very low level, bringing them within the envelope of anti-aircraft artillery (AAA).

Post-war, the USA mounted a concerted effort to supply air defence suppression equipment. The new kit included improved electronic counter measures and additional Shrike air-to-ground anti-radar missiles. The Shrike targets a SAM battery's radar antenna. As the author witnessed in clashes with Syrian forces between October 1973 and April 1974, the new equipment was not altogether successful. The ECM was insufficiently developed and the Shrike missiles had too short a range.

As the Israelis were loathe to loose further expensive Phantoms and invaluable air-men, a further option was sought.

The result was the turretless Sherman mounting a single modified Shrike. The

missile was fitted with an Israeli-developed rocket booster to compensate for a ground launch, and had a respectable range of sixteen kilometres.

The Sherman plus Shrike (code-named it is believed, the *Klachlanit*), would be trundled forward to the edge of the battlefield and camouflaged until needed. An Israeli aircraft would fly just within range of enemy SAM launchers, and tease Arab air defence personnel into switching on their search and targeting radars. Once these locked on, the aircraft would breakaway and maneuver to safety. In the interim, the *Klachlanit* crew would have launched their Shrike along bearings given to them by the pilot, often assisted by electronic gear carried by Iroquois helicopters hovering out of range of SAMs.

After Arab air defence personnel had assimilated this tactic the main use of the *Klachlanit* was to suppress enemy radar sites — make the operators afraid to switch on their equipment — rather than to destroy the radars themselves.

With the advent of improved ECM, longer ranged anti-radar weapons, and unmanned anti-radar drones and decoys, the reasoning behind the *Klachlanit* disappeared. The *Klachlanit* remains a monument to the ability of the Israelis to improvise, producing effective weapon systems through "cutting and welding" work on elderly fighting vehicles.



# The Ordnance Museum Foundation

## Executive Director's Corner

P.O. Box 688  
Aberdeen Proving Ground, MD 21005

### FELLOW MEMBERS:

The major activity since the last report is the formation of the "Action Committee" on August 21, 1997. This is the committee structured by Helen Bentley & Associates that is made up of representatives of industry, local, state, and federal governments to work with us to raise the funds for the new structure.

The Action Committee is made up of the following:

General Chairman: Fred Sypher, VP of AAI Corp.

Sub Committees: (Initial membership)

Private Industry: Chair: Jeff Braverman Members: Mike Armstrong,  
Steve McCune Ray Nichols Rick Priddy,  
Marie Steen, Fred Sypher

State Government: Co Chairs: Jim Harkins & David Craig

County Government: Chair: Bill Rutherford Members: Ronnie Chenowith

Federal Govt: Chair: Elliot Deutsch  
Ex Officio: Bridig Smith (For Sen. Sarbanes)

Inkind Services: Co. Chair: Neal Wright and Rich Carnegie

Large Gifts: Chair: Joanne Parrott

Foreign: Chair: Helen Bentley Member: Chuck Cresswell

Each of these sub Committees will structure a program and lead the effort to obtain funds from these potential sources. There was a lot of enthusiasm and ideas discussed at the initial meeting. As the Committees form their programs, We will highlight them for you in upcoming articles. A number of you have offered to help and we have not replied previously because of the lack of this kind of program and support. If you would like to be on any one of these Sub Committees please let us know! Even if you cannot attend the meetings, your help in suggesting contacts or innovative strategies will be welcome.

An interesting perspective of the Action Committee members is the emphasis on promoting the "Human" aspect of the material we are preserving. It is an aspect I personally believe is one of the most interesting of the evolution of weapons. The facility we will provide will allow the Museum to properly display in context of the individuals who depended on and interacted with this equipment. I believe both the appeal for funds and the facility will benefit from this perspective.

Rich Carnegie  
Chairman - Board of Trustees

## TOOLS of WAR

### A Guided Tour of America's Premier Wartime Museum

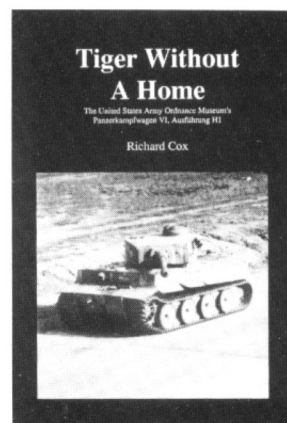
Order this exciting video and learn more about the museum, what is being done, and how you can help. **Special Foundation member price of \$15.00** (Members are those that joined at the \$25.00 level or above) plus \$5.00 shipping and handling

Order directly from  
Ordnance Corps Association  
P.O. Box 377

Aberdeen Proving Ground, MD 21005-0377  
(Maryland residents add 5% sales tax)

## TIGER WITHOUT A HOME

Order your copy today!!  
\$12.95 per copy plus  
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\$250.00



## Egypt Estimates 23 Million Mines

Angola, Mozambique, and Cambodia are places that come to mind when the subject of land mines comes up. However, Egypt has been raising the awareness of their mine problem.

Starting in WWII, with the German Afrika Korps laying more than five million mines, not counting the British Commonwealth mine fields. Adding in the mines that were laid during the four wars with Israeli, Estimates are that almost 23 million mines are buried in Egyptian soil, according to a recent International Red Cross report.

Last November, rains in the Sinai unearthed more than 700 mines, according to a brief in "Jane's Defence Weekly."

The problem has inhibited Egypt's tourism growth, as well as agricultural expansion.

Based on costs to remove mines to date from Egypt, the cost for the removal of the remaining mines could cost more than \$190 million.

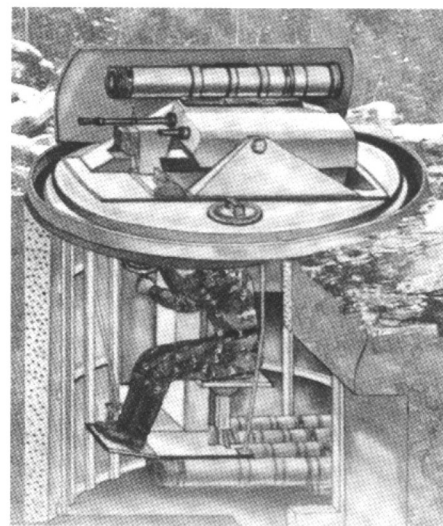
## GORCHAK Universal Pillbox

With the breakup of the former Soviet Union, the Russians now find themselves with more neighbors than before. Perhaps with this in mind, Motovilikha of Perm, Russia has developed the Gorchak UP (Universal Pillbox) for static defense.

Basically an armored fighting compartment contained in an enclosed cylinder-shaped unit. The top of the cylinder is flat with a single hatch that covers the dynamic armament component.

The UP is buried with only about 150 mm of the top plate exposed which makes it easy to conceal. Using periscopes, the two-man crew can observe the battlefield.

To engage the enemy, the top hatch is opened and the weapons unit is raised. Armed with a PKM 7.62 machine gun (1,700 rounds), an NSV 12.7 mm machine gun (480 rounds),



an AGS-17 30 mm grenade launcher (360 rounds), and a 9K111 Konkurs missile launcher. Advertised engagement ranges included 2,000 m against infantry and lightly armored vehicles, 70 to 4,000 m against tanks, and up to 1,500 m against helicopters.

The system has full 360 degree traverse and when in the raised position the weapons' unit is only about 600 mm above the ground.

The means by which the crew enters and leaves the UP is not clearly explained nor is it shown in the drawings included here. The descriptive leads you to believe that the UP can be "dropped" into an opening but again, that is not clear.

General Dynamics Land Systems recently completed field testing of an M1A2 Abrams using a diesel engine. The tests spanned about thirty hours and covered 100 miles. Conducted at the Sterling Heights, Michigan facility and General Motors Milford test track, the tests ended on July 30.

The Europack is a powerpack which combines the Motoren-und Turbinen-Union MTU-883 1500 hp diesel engine and the RENK, AG, 295TM transmission. Both MTU and RENK are German-based companies. The Europack is currently in use with the French LecClerc main battle tank.

The M1A2 diesel was put through a variety of tests including, serpentine steering, pivot steers, acceleration, braking, speed on grades, and turning among others.

According to GDLS, the tests validated the automotive integration of the Europack and the performance results were comparable to the gas turbine-powered M1A2.

A diesel M1A2 is aimed primarily at the export market, with Turkey and Greece thought to be two potential candidates.

## Diesel-Powered M1A2





# China Develops Type 90-II for Export Market

China North Industries Corporation (NORINCO) is developing the Type 90-II main battle tank for the year 2000. According to NORINCO officials questioned at IDEX '97, the tank is destined for the export market and there are no current plans to introduce it to the People's Liberation Army (PLA).

First revealed in 1991, the Type 90 is under manufacture in Pakistan, and has been referred to locally as the Khalid.

The latest Chinese version shown now sports reactive armor in the form of detachable ceramic blocks on the hull front and the front, top, and front-sides of the turret. Company literature also states that the front four rubber side skirts can be replaced with reactive armor protection.

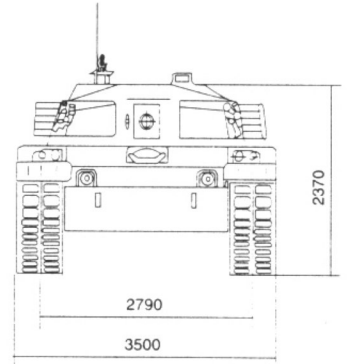
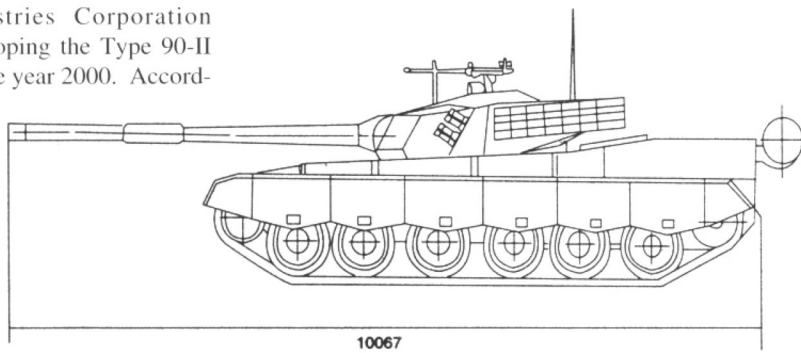
The 48-ton tank is powered by a 1,200 hp, 12-cylinder diesel engine (CV12-1200 TCA), which gives a maximum road speed (4th gear) of about 62 km/h. The French-made gearbox is automatic with five forward speeds (including a crawler gear) and two reverse. The complete powerpack (engine, transmission, and cooling system) can be removed as a single package.

Equipped with an autoloader, the Type 90 only needs a crew of three. The 125 mm smoothbore main gun has a twenty-two round carousel and can fire HE, APFSDS, and HEAT. One drawback is that when loading the main gun, there is a slightly more than four degree elevation limitation. Total ammunition onboard was not given. The rate of fire is "no less than 6-8 rounds per minute." Barrel life is expected at about 500 rounds, but would vary based on ammunition mix.

There is a 7.62 co-axial machine gun and a 12.7 mm turret-mounted machine gun for the commander. Onboard ammunition stowage is 3,000 and 500 respectively.

There are two smoke grenade discharger banks, one located on each side of the turret.

The fire control system includes a laser rangefinder and is computer aided. The gunner's sight is stabilized in two axis while the commander's sight (which has override capability) is also two-axis stabilized but in the panoramic. Again, using company literature, the hit probability at a target range of 1,500 m is about 71%.



## Saudi Arabia Readies for Big Buys

The Saudi Arabian National Guard has requested to purchase more than \$1.6 billion from the U.S. to upgrade its combat abilities. The deal is to include 130 90 mm cannons for light armored vehicles (the SANG is equipped with Cadillac Gage V-150 armored vehicles) (this purchase also includes 169,490 rounds of 90 mm ammunition), 130 M240 machine guns, and 130 M2 .50 cal. machine guns.

In addition they are set to take delivery of 1,224 VHF radios (including VRC-90, -92, and -119 sets) and 42 RT-1702C HF radios.

In other big news for the country, they seem ready to finalize a deal with Denel of South Africa for G-6 self-propelled artillery pieces. The deal worth an estimated \$1.6 billion. The deal would be a windfall for Denel and for the South African economy. Although not confirmed, and with other countries still in the race, the deal is far from complete.

To emphasize the importance of the deal, Denel took two South Africa newspaper to court to win a restraining order on their release of Saudi Arabia's name as the customer involved in discussions.

This all comes at a time when South Africa itself is entertaining offers from Britain, France, Germany, and Spain for package upgrades of its navy, air force, and in some offers, its' tank fleet. The U.S., while interested in talking to South Africa, is still not allowed to have any direct discussions with Armscor relating to military equipment due to issues involving a court settlement.



## ROAD TO THE KILLING FIELDS

### The Cambodian War of 1970-1975

By Wilfred P. Deac, Foreward by Col. Harry G. Summers, Jr.

328 pages, 10 b&w photos, 4 maps

1997 ISBN 0-89096-750-4

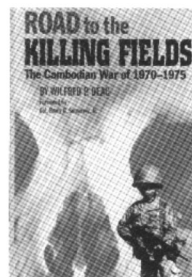
Texas A&M University Press

Drawer C, John Lindsey Bldg

College Station, TX 77843-4354

1-800-826-8911

\$34.95



Finally, thirty-two years after the collapse of the Cambodian government to the forces of the Khmer Rouge, a book has been written about the military aspects of the war. Books galore have been written about Vietnam (North and South) and even Laos has had an excellent military study published. But lowly Cambodia, as one author put it, was a "side-show."

Wilfred Deac has put together a wonderful study of the slow and painful death that Cambodia suffered from 1970-1975. A pawn

in the larger Southeast Asian war, it was always supported enough to be viable but never enough to see real success.

The U.S. was of course, a major player in the events in Cambodia and through a balance use of reports and information, Deac shows how those efforts bear much of the responsibility for the failures of the policy in Cambodia and the path that the war took.

On the other hand, he also points heavily at the corruption, poor leadership, lack of

Cambodian commitment, and internal bickering that led down the path to failure.

Early in the war, it seemed on several occasions that the Cambodian Army (FANK) put together successful operations only to have those gains pushed back, usually with considerable loss of life and materiel. The aims early on never seemed to be how to win the war, but how much of the country could they control. In fact U.S. evacuation plans were drawn up as early as 1973.

Offensive combat in Cambodia seemed to centered completely around FANK road and river clearing operations and city and strongpoint defenses. Although there was some armor (according to the author, about twelve old AMX-13s and seven M24 light tanks), in the later years the most common vehicles were M113, some with 106 recoilless rifles. The author does a nice job of giving you a feel for the plight at every level within the FANK military — from the soldier in the foxhole to the commander-in-chief.

"Road to the Killing Fields" keeps the story flowing with a running chronology of the military situations while at the same time keeping those events in context with the political and international

This book fills a gap for students of the war in Southeast Asia and tells an important story with great clarity. The horrific humanitarian catastrophe that engulfed the Khmer Republic in 1975 needs a perspective and this book provides that foundation.

## ARMOR OF THE VIETNAM WAR

### (1) Allied Forces

By Michael Green and Peter Sarson

72 pages, 182 photos, sixteen color plates

1996 ISBN 962-361-611-2

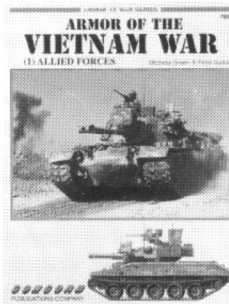
Published by Concord Publications Company

603-609 Castle Peak Road

Kong Nam Industrial Building 10/F, B1 Tseun Wan

New Territories

Hong Kong



Over the past few years, mixed in with a standard collection of popular German and other WWII titles, Concord has shown some daring in releasing books that show what rarely is seen. They have done books on Afghanistan, the United Nations forces, the Middle East, and Angola to name a few.

"Armor of the Vietnam War" follows the similar look of the other titles. A nice color cover is followed by more than 180 black and white photos and a selection of Peter Sarson's color plates.

This book covers mainly U.S. vehicles

including the M48A3 (one photo of an M48A2), the M551, various M113 versions, the M728, Ontos, Scorpion, LVTP5A1, M110, M107, M109, and several others. As inevitable with any book, there is some photo duplication with Squadron's "Armor in Vietnam" book, but I believe the number is less than ten.

The book's focus is to provide "a quick

look at some of the various types of armored vehicles employed by the U.S. Army, Marines Corps, plus the ARVN and various Allied Forces." In the former, for U.S. vehicles the book does a very nice job of looking at many of the various types used, and of the modifications and "stuff" the crews managed to hang on the vehicles. Likewise, coverage of the ARVN M113s was well-rounded. However, there were only two photos of ARVN tanks (M41s), seven Australian (two Centurions), and one South Korean. This is probably more a reality of the size of the book than the amount of material available.

The color plates are nicely done and make the book more appealing to modelers as well as armor and Vietnam enthusiasts.

As the title suggests, there should be a follow-on title.

Despite my comments on the scope of Allied coverage, the book provides a terrific look at how the armor looked in the fields of Vietnam. The photos captions are well done and informative, and except for one on page 42 (lower left) are in the right place. A good value for the material.



# Vehicle Mounted Mine Detector

By  
**JEFF MCKAUGHAN**

*Not always known for looking outside of its own industrial base for defense solutions, the U.S. Army has finally adopted a foreign mine detection system that modernizes its countermine program and lessens the risk to the individual soldier.*

While the world's attention has been focused on the events in Oslo surrounding the treaty banning the use of anti-personnel mines, the work towards an anti tank mine solution has never missed a beat. The US Army is in the final stages of acquiring an interim mine detection system that is something other than a soldier walking along with a hand-held detector, or having a vehicle find a mine by running over it.

In mid-1997, tests were conducted at APG between two competing systems for an interim anti-vehicle countermine system. The final candidate is the Vehicle Mounted Mine Detector 1000 built by Dorbyl of South Africa. The system is currently in service with the South Africans, while the French and the British have also acquired the system.

The VMMD is a mine detection system as opposed to a single mine detector. It is composed of a lead mine detection vehicle (MDV), called a Meerkat, followed by a larger, but similarly designed towing mine detection vehicle (T/MDV), called the Husky. The Husky, besides having the same detection equipment as the Meerkat, also pulls the weighted trailers called Duisendpoot (centipede), that are designed to detonate any mines that are missed by the two detection units.

These two vehicles are followed by two truck/light utility vehicles, each towing a spare wheel/frame module — one for the Meerkat and one for the Husky. The spare wheel/frame modules are referred to as Red Packs. A container box (called a Blue Pack) with heavier spares for more involved repairs is sent to the local maintenance shop to support the VMMD operation over a longer term. This container will include items such as engines, and additional tires.

The Meerkat and Husky are both of similar modular frame construction that allows for easy field repair if damaged by a

mine blast. In fact this is one of the key points of the system. The front and rear frames, which includes the tires, suspension, steering mechanism, differentials, etc., are designed with shear points to break away in such a manner that an entirely new frame can be attached after the damaged one has been removed. By looking closely at the two Red Packs you can see that the front and back of each is a replacement frame, one each for the Meerkat and Husky.

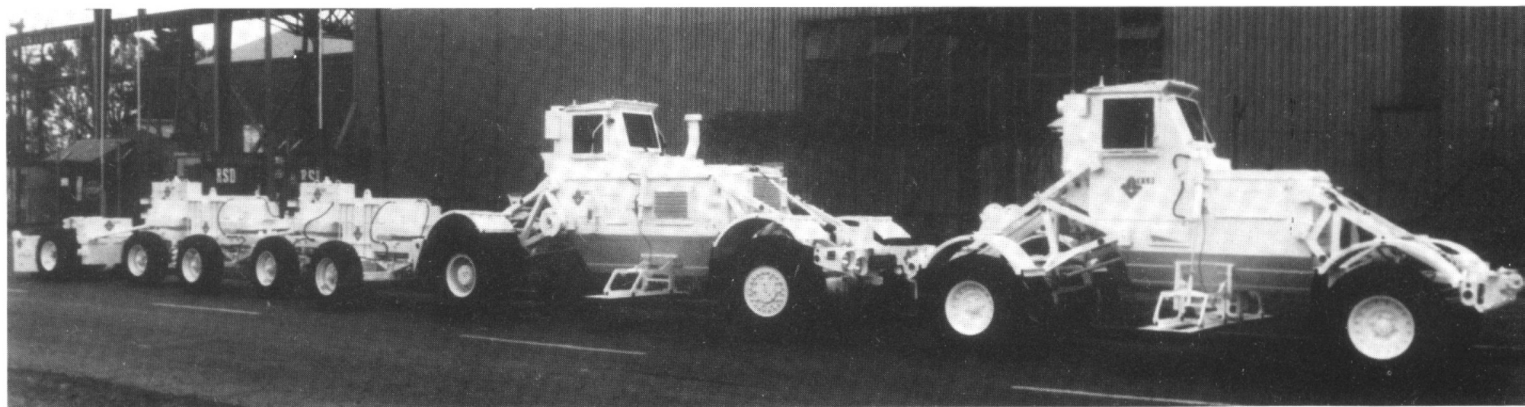
Their hulls are designed with a typical mine-resistant V-shaped bottom, reinforced with armor plate. The Meerkat is powered by a four cylinder, water-cooled diesel engine, while the heavier Husky has a six-cylinder turbo-charged diesel engine.

The heart of the detection system rests in the hydraulically controlled detector pans located in the center of both vehicles. They are three meters wide and are pulse-induction detectors. The sensitivity of the pans can be adjusted to null out the effects of the vehicles and to reduce the level of false alarms caused by less dense and non-dangerous articles. They can be used at speeds of up to 35 km/h, survey to a depth of about 0.5m, and be used both on and off road.

The Duisendpoot is comprised of two four-wheel trailers and a single five wheel one. This gives full "proofing" of the swept path. If the detection fails to locate a mine, one of the trailers will pass over the mine and detonate it. The Duisendpoot acts as its own Red Pack, carrying replacement springs, A-frame, and various other smaller parts along its back.

Weight is a critical factor with the two detector vehicles as they want to be light enough as not to trigger any anti-vehicle mines as they cross over them. Other than the construction and design principles being driven by this need for a low weight, there are

*At the Dorbyl/RSD facility in South Africa.*







*The Husky pulling with the first of the Duisenpoot trailers. This South African system only displayed the two-trailer arrangement. Also note that if this was real sweep, the spare tires would have been removed, probably the fenders, and the detectors pans would be down.*

operational methods that aid in this as well. The first is that to reduce the ground pressure, the amount of air in the tires is reduced so the tires flatten out and cover more ground space, thus reducing the overall weight per square inch. The newest versions of the VMMD offer a much improved system for selecting predetermined tire pressures and for setting the tires to those pressures. (During a demonstration, the author witnessed the Meerkat, with very low pressure in the tires, drive over the hand of a U.S. Army officer — no damage, no pain!)

Secondly, and seemingly obvious, is the removal of everything from the Meerkat and Husky that is not absolutely necessary for the mine detecting operation. Most photos show both vehicles with spare tires and fenders, all would be removed in actual operations.

In current South African operations the Meerkat will lead the way, followed by the Husky towing unit and the vehicles with Red Packs. One of these two vehicles would also act as the command vehicle for the operation. When either, although preferably the Meerkat, encounters a metal-cased anti-vehicle mine, and the driver receives an audible warning. When detected, the driver would stop and slowly reverse over the mine to further pinpoint its location. Using an onboard dye-marker system, the location would be marked.

The Meerkat would then backup an additional distance and stop. The Husky would then pull up to the very back of the Meerkat, followed by the rest of the column. The mine removal team would then move forward by walking over the top of all vehicles, thus reducing the possibility of setting off an anti-

personnel mine. Then, moving ahead of the column, preferably using a hand-held mine detector, the team would further pinpoint the mine and remove it by hand. The column would then move on and the process repeated.

If, by chance, both the Meerkat and Husky fail to detect a mine, the Duisenpoot trailers would then detonate them by pressure. As a safety measure, if the trailers do set off a mine they are automatically separated from the Husky.

## U.S. REQUIREMENT

After Somalia, the army was tasked with surveying the available technology of countermining warfare and establish both a short and long term solution to the problem of mines. That search resulted in the testing in mid-1996 and the final down-select to the VMMD in 1997.

After the 1997 test phase, and from operational feedback from the French, a number of changes, albeit in most cases rather minor ones, were instituted. One major change requested by both the French and the Americans was the addition of a third Duisenpoot trailer. With the previous arrangement, the center section of the path was not traversed by the trailers leaving a potential landmine behind. This third trailer covers the full width of the cleared path with wheels from the trailers. Other changes include a better tire pressure control system, handrails and foot pads for climbing in and out of the vehicles, a heater in both detection vehicles, a solar battery charger for the spare

# Mine Detection by Remote Control

The major long-term goal of the army's countermining program is to reduce the risk to soldiers when searching for mines. The most obvious solution for this is the use of remote control ground search vehicles. (regardless of the technology, sensor detection from the air still requires somebody to go and find the mine of the ground!)

Omnitech Robotic, Englewood, Colorado, has been working with the army and has a number of solutions being tested, in controlled tests in the U.S. and on the road in Bosnia. The Panther is a remote controlled turretless M60 with mine rollers being fielded and tested in Bosnia. It utilizes a Standardized Teleoperations System (STS) which controls the major driving functions of a vehicle uses video cameras and a controller unit, which looks much like a large suitcase.

With some modifications, the STS has been mated to the older of the two Meerkats that the army has. The STS-equipped vehicle can be operated by a soldier or by remote control as dictated by field operations and the changeover from one mode to the other can be transitioned to in a matter of seconds.

The controller unit has a high resolution monitor capable of bright daylight viewing, a keyboard, and can be equipped with a number of modules as determined by the vehicle being operated. The same controller unit, with different modules can control a variety of vehicles once the modules have been exchanged. To further standardized the operation, the controller unit can mount either control levers (for most tanks) or a steering wheel to better replicate the vehicle being operated.

The Meerkat is equipped with a forward and rear facing camera, and internal hookups feed the vehicle's instrumentation panel to a panel displayed on the controller. In the Meerkat, because weight is so critical, all of the controls for the throttle, brake, gear shift, etc are value operated on compressed air as opposed to the mechanical linkages for the other vehicles tested.

The controller unit is fixed in a vehicle with mast antenna affixed and must remain in line-of-sight to the Meerkat, limited by the range of the camera feed.

Although not a part of the VMMD acquisition, this system will be tested vigorous with the goal of having the option for either manned or unmanned operation available to the commander in the field.





*Although a dark photo, it illustrates the operation after a mine has been detected and pin-pointed. After marking the location, the Meerkat, backed up a safe distance and stopped. The Husky pulled right up behind and the Casspir (with the mine clearing team) is shown moving up directly behind the last Duisenpoot trailer.*

batteries carried in the Blue Pack, an improved jacking system for repairing damaged vehicles, and a more robust (and more readily available) rear differential (although lighter in total weight) on the Husky to name a few of the modifications.

In South African operations, the Red Packs are towed by Casspir or Buffel mine-protected vehicles. The tow vehicles with the U.S. engineer units will be vehicles already in their inventory. While a HMMWV has the capability of pulling the load, it is more likely that either 5-ton or dump trucks will serve as the tow vehicles.

The U.S. Army now owns two of the systems, one acquired and tested, including actual mine demolition testing (and repairing). The vehicles will move on later in 1997 to Ft. Leonard Wood for further testing and training with the army expected to purchase ten vehicles in 1998 (probably by late 2nd/early third quarter) with an option for ten more in 1999. Cost at this time is estimated at about \$1.5 million per system.

The protection offered to the operator, the reparability of the vehicles, and the fact that the system proofs its detection capability are all solid reasons for the army's decision.

LNy, a New York-based company, is the North American representative for Dorbyl and has worked very closely with the Countermine Division of the U.S. Army to position the VMMD as the system of choice. As South Africa had been isolated from the world's defense community for so long, it was important to have U.S. company actual be involved in the sale. In fact LNy represented TFM of South Africa and registered the first sale of South African equipment to

the U.S. Army when they signed a deal for five RG-31 light mine-proof vehicles. These vehicles are now in Saudi Arabia.

The South Africans have a long proven history of countermine operations and are world leaders in its technology and skill management. The VMMD is the superior detection system on the market today. Other methods are either too technologically immature or use the "farm implement" method of detection – turn your trail into a pasture with plow!

Hand-held mine detectors will not leave the army quite yet, in fact there are four of them in the Blue Pack, but perhaps we are

getting closer to the day when the U.S. Army will have the proper tools (or at least the best available tools) to do the job. The VMMD is that interim tool and leads all others in the both military and humanitarian task of detecting mines.

The Army will continue towards a solution that will meet all of its future (planned) requirements while the VMMD meets the current requirements, and by using the non-developmental approach has probably shaved at least two years off the acquisition time. This puts the equipment in the hands of soldiers much sooner and most likely at a favorable cost.



*The mine clearing team is shown here crossing over the top of the detection vehicles, the lead team member has a hand-held mine detector to ensure a safe path to the mine and to find the mine for removal/destruction.*

# Canadian Armored Regiments

## Organization & Equipment, North-West Europe 1944-45

By  
Chris Johnson

### War Establishments

During the Second World War the Canadian Army followed British unit organization and doctrine. Organizational tables were known as War Establishments (WEs), and these documents detailed the structure of units including vehicles, armament and personnel complements.

A WE was intended as a guide to the commanding officer of a specific unit. He was permitted to adapt the organization in accordance with administrative and tactical requirements as he saw fit. It was not at all unusual for him to change the task and add or delete certain of the vehicle types carried on strength, in a manner that best served the operational requirements of his unit. WEs were updated and revised periodically to reflect changes brought about through operational and administrative experience.

### War Establishment of a Canadian Armoured Regiment

Effective 12 January 1944, First Canadian Army in Great Britain propagated "An Armoured Regiment, CAC War Establishment, Cdn. II/151/3". This WE would serve as the basic model for armored and armored reconnaissance regiments that served in 4th Canadian Armoured Division (4 CAD) and 2nd Canadian Armoured Brigade (2 CAB); both of which fought under Britain's 21st Army Group in the North-West European campaign.

WE II/151/3 laid out the basic organization of a 1944 armored regiment which was commanded by a lieutenant colonel. It was to be composed of a Regimental Headquarters (RHQ), three fighting squadrons identified as "A," "B," and "C" and administrative

elements sufficient to support both the regiment in whole, or any of its components on their own. (See Schematic 1 and 1A.)

### RHQ

RHQ was responsible for command and control functions and it also maintained sufficient personnel, vehicles and weapons to protect itself. It was composed of an RHQ Troop and a Headquarters Squadron which consisted of a Reconnaissance Troop, an Intercommunication Troop, an Anti-Aircraft Troop and an Administrative Troop. (See Schematic 1.)

### RHQ Troop

The tank complement of RHQ Troop consisted of four Sherman Mediums; either the Sherman III (M4A2) or the Sherman V (M4A4). The regimental commander's Sherman, from which it was intended that he was to exercise his command function, was equipped with two No. 19 wireless sets and was referred to as a "Tank, Control". A second Sherman was also fitted with two No. 19 sets and operated as a "Rear Link". The 2i/c of the regiment was assigned to this tank and one of his duties was to maintain a line of communication from the regiment back to Brigade. During operations, while the 2i/c was normally Left Out of Battle (LOB), he was still responsible for other regimental administrative duties. The RHQ Troop leader; a lieutenant, and the RHQ Troop Sergeant rounded out the commanders of the other two Shermans.

### Headquarters Squadron

Headquarters Squadron (HQ Sqn) in RHQ provided the command and control element for the administration of the entire regiment.

### Reconnaissance Troop

The Reconnaissance Troop consisted of eleven Stuart light tanks. For the invasion of North-West Europe, the Stuart V (M3A3) was identified as the light tank of choice to equip the armored regiments and as the campaign progressed, it was supplemented by the improved Stuart VI (M5A1). The envisioned role of a reconnaissance troop was to provide the regimental commander with immediate reconnaissance to his front and flanks. British doctrine recognized that with their light armor and weaponry, they should not be expected to fight for information. In the Italian theater, Canadian Stuarts operated without turrets as was the form in Eighth

Army, but in North-West Europe, complete Stuarts were employed. Regiments arriving from Italy in early 1945 were re-equipped with turreted Stuarts for reconnaissance.

### Intercommunication Troop

The Intercommunication Troop was composed of nine scout cars; either the Canadian Lynx or the British Humber. The troop was often dispersed throughout the regiment as individual vehicles to liaison officers, RHQ Troop, or Squadron Headquarters (Sqn HQ) as required.

### Anti-Aircraft Troop

The AA Troop consisted of six Crusader III AA Mk. II tanks with twin 20mm Oerlikon guns. Anticipated for use against German aircraft on the Continent, Allied air superiority ultimately permitted them to be employed in a ground support role.

### Echelons

The basic organization of an armored regiment provided for administrative troops on a scale of one for RHQ plus one per fighting squadron. This permitted the regiment to be administratively independent and also allowed each of the squadrons to operate on their own as operations required.

For purposes of command and control, the administrative organization of the regiment was divided into four "echelons" as follows.

(a) "F" Echelon - This was the fighting echelon and consisted of all of the regimental tanks and other AFVs in addition to the Medical Officer with his armored halftracks and the technical officer together with his ARVs and other assorted recovery related vehicles.

(b) "A1" Echelon - This was strictly administrative in nature and carried up to 20% of the fighting echelon's requirements of fuel and ammunition.

(c) "A2" Echelon - Another administrative echelon which carried approximately 30% of the "F" Echelon fuel and ammunition requirements. "A1" and "A2" Echelons gave the regiment 50% of its required fuel and ammunition within reasonable distance of the fighting echelon and they also covered a normal full day's projected requirements. A Light Aid Detachment (LAD) was attached to the "A2" Echelon.

(d) "B" Echelon - This last echelon carried the regiment's remaining 50% re-



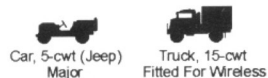
# Canadian Armoured Regiment - 21st Army Group January 1944

## Regimental Headquarters



## Headquarters Squadron

### Squadron Headquarters



### A A Troop



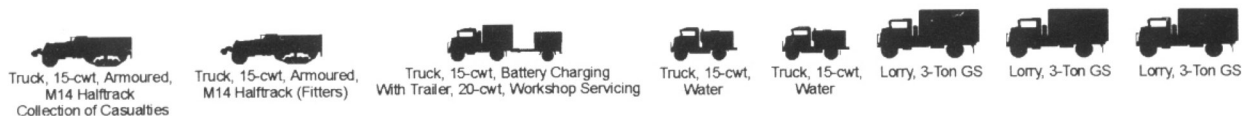
### Reconnaissance Troop



### Intercommunication Troop



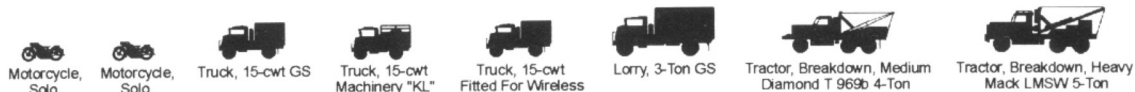
### Administrative Troop

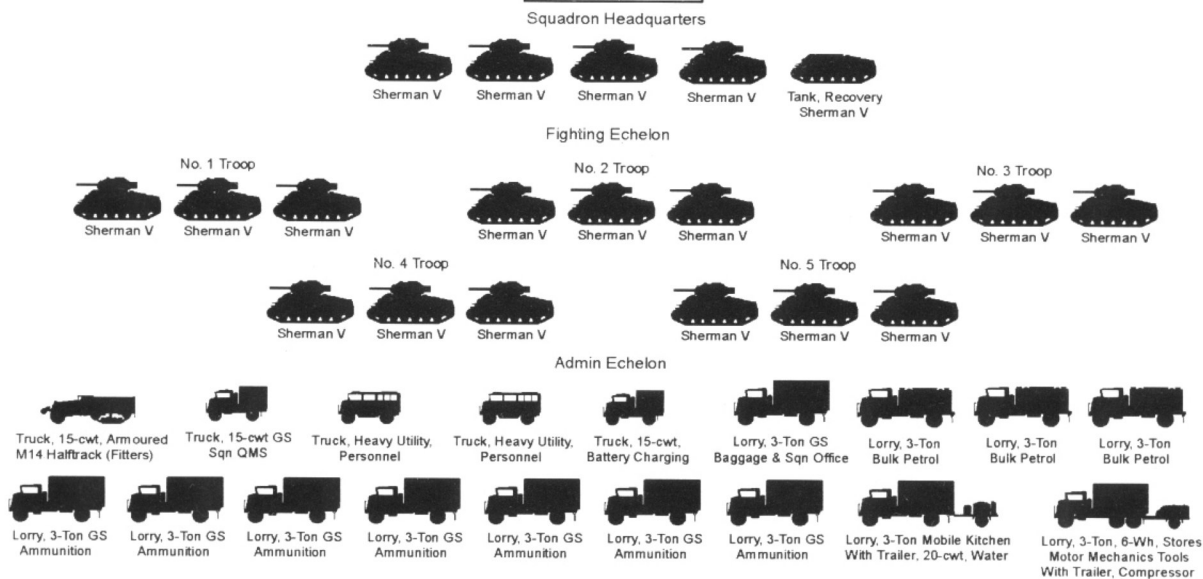
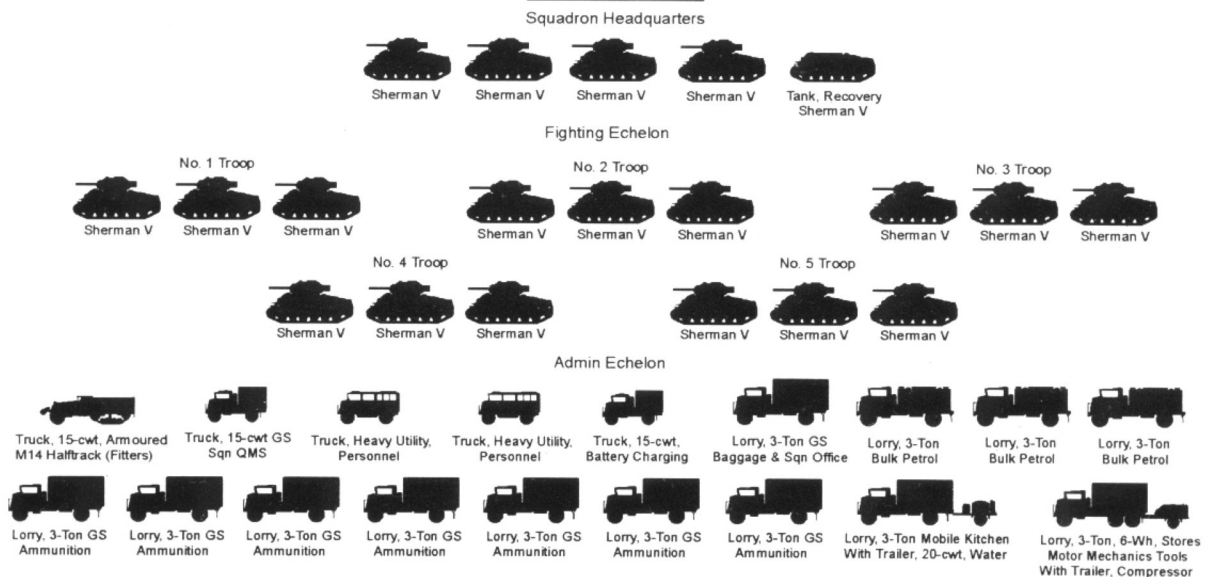


## Royal Canadian Signals Corps Detachment - Attached To Regiment



## RCEME LAD Type "C" Armoured - Attached To Regiment



**"A" Squadron****"B" Squadron****"C" Squadron**





quirements of fuel and ammunition, in addition to the rations, baggage and stores not normally required by the fighting echelon at short notice.

"A1" Echelon itself was normally commanded by the administration subaltern in HQ Sqn and moved with "F" Echelon. Both "F" and "A1" Echelons fell under the direct command of the unit CO. "A2" Echelon was commanded by the HQ Sqn 2 i/c and "B" Echelon normally fell under the command of the HQ Sqn commander.

#### Light Aid and Signals Detachments

As mentioned previously, a Type "C" Armoured LAD of the Royal Canadian Electrical and Mechanical Engineers was attached to the armored regiment in addition to a detachment from the Royal Canadian Corps of Signals.

#### Fighting Squadrons

Each of the three fighting squadrons were commanded by a major. The 1944 WE called for four tanks plus an Armored Recovery Vehicle (ARV) at Sqn HQ. Each of the tanks were 75mm Shermans. The squadron commander had one and the others were commanded by two captains and the squadron sergeant-major. The senior captain, the 2 i/c of the squadron, was LOB and would come forward to assume command if the squadron commander was incapacitated. The junior captain, known as the "Battle Captain", operated as Sqn HQ troop leader and more importantly, as Rear Link to RHQ. His tank moved with the squadron commander at all times. If the squadron commander was knocked out of action, the Battle Captain assumed immediate charge until the 2 i/c could come up from the rear. The ARVs attached to Sqn HQ

consisted of either turretless Sherman III or V, ARV Mk. Is.

Each squadron had five troops of three Shermans each. Troops were commanded by lieutenants, with a sergeant and corporal rounding out the tank commanders in each troop. The squadrons therefore fielded nineteen tanks each. With three fighting squadrons in an armored regiment, the "F" Echelon consisted of sixty-one Shermans, eleven Stuarts, six Crusaders, nine scout cars, three ARVs and seven M14 halftracks. (See Schematic 1A.)

On or about 15 June 1944, 2 CAB, operating in support of 3rd Canadian Infantry Division (3 CID), issued a directive that it's armored regiments would switch to a four troop/four tank organization and 4 CAD followed suit. That required Sqn HQ to be reduced by one tank which was moved to the troop level for a total of sixteen tanks in the troops and three at Sqn HQ. Each troop would henceforth field three 75mm Shermans plus one Firefly. Troop tanks were commanded by a lieutenant and two corporals in the three 75mm Shermans with a sergeant commanding the Firefly. (See Schematic 2.)

In early 1945, with larger stocks of Fireflies becoming available, each troop was again re-organized with a complement of two 75mm Shermans and two Fireflies. The numbers of 75mm gun tanks remained constant to the end of the war at two per troop as the 75mm high explosive (HE) round was considered to be essential to operations and superior to the 17-pdr HE round. (See Schematic 3 on page 16.)

#### Specialized Tanks

As detailed above, an armored regiment included specialized ARVs and AA tanks. Prior

to the invasion of Normandy, armored regiments were also issued with Sherman Fireflies on a scale of twelve per regiment for use in an anti-armor and "hole punching" capacity.

In the case of the two armored regiments engaged in the initial assault phase on D-Day, the Fireflies were concentrated in one squadron which would land dry-shod as the length of the 17-pdr gun tube on the Firefly negated it from being equipped with flotation screens necessary for a swimming assault on the beaches. In the Fort Garry Horse, the Fireflies were concentrated in "A" Sqn and in the case of the 1st Hussars; "C" Sqn. The other two squadrons of each regiment were equipped with Duplex Drive Shermans (DDs) which were conversions of the standard Sherman V.

The Sherbrooke Fusiliers retained a standard three squadron dispersion of Fireflies as it landed in reserve without any DD tanks.

The Sherman VC Firefly version initially equipped Canadian armored regiments, but as the campaign progressed, the Sherman IC supplemented the VC. It could be either the standard IC or the later Hybrid model, although the Hybrid appears in most photographs of the period.

In early 1945, armored regiments were issued with a Valentine Bridgelayer which negated the need to await while one was sent forward from Brigade during a stalled advance due to physical barriers. Regiments that fought throughout the North-West European campaign were issued Ram Wallaby ammunition carriers in early 1945 while those arriving from the Italian theater retained several of their turretless Stuart Vs in that role.

Lastly, each Sqn HQ acquired two Sherman IBs (M4 with 105mm Howitzer) for

## Schematic 3

### Squadron Organization - Early 1945



use in a close support role. (Schematic 4.)

There was at least one notable exception to the rule; that being the 29th Armoured Reconnaissance Regiment (The South Alberta Regiment) of 4 CAD. The South Alberta's fought through Normandy without any Fireflies on strength. They received their first of the type on 09 September 1944. While they were issued with a Valentine Bridgelay and Ram Wallaby ammunition carriers in early 1945, it appears that they never received any Sherman IBs.

### War Establishment Adaptations

Throughout the campaign in North-West Europe, regimental commanders individualized their WE to fit operational requirements. Squadron commanders often found it more practical to command from a scout car in many instances and the regimental com-

mander himself found it more practical to exercise command from an alternative command vehicle.

In the case of the South Albertas, Lt.-Col. Wotherspoon considered it impractical to command from a Sherman and therefore maintained a White M3 half-track in RHQ Troop together with a scout car. The half-track was fitted with two No.19 wireless sets together with a situation map and functioned as an alternative command vehicle, although it was generally known in the regiment as an armored command vehicle.

### Conclusion

The Canadian armored regiment of 1944-45 ultimately evolved into a potent offensive and defensive force, especially when used in combined tank/infantry operations. The basic organization proved it's worth by demon-

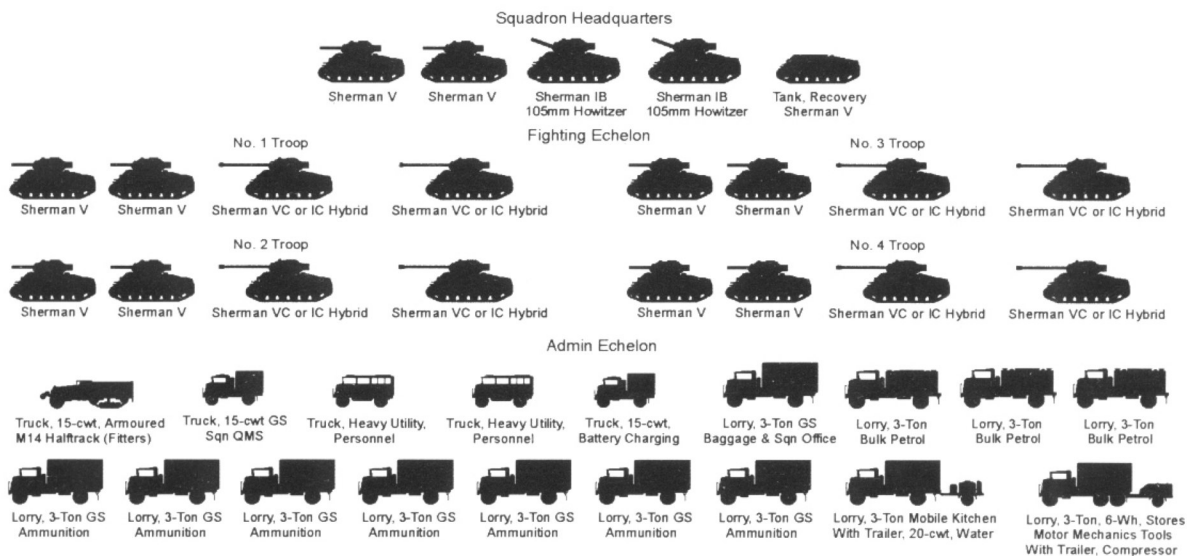
strating a capacity to undergo periodic revisions in adaptation to changes in operational requirements.

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## Schematic 4

### Squadron Organization - Final Model



© C. Johnson, 17 July 1997



# THE BATTLE OF EL UACH

By  
Adam Geibel

By December 1940, the worldwide situation looked bleak for the Commonwealth forces. Greece was a nightmare, and the Japanese appeared unstoppable. The Italian East African empire could field over 250,000 troops and threaten Khartoum, Kenya, and the southern approaches to the Suez Canal. Some 77,000 Commonwealth soldiers were idle in Kenya, still in training. Churchill demanded action.

So the first South African counteroffensive in East Africa would be a dress rehearsal for the assault on Kismayu, Somalia. General Godwin-Austen chose the Italian border fort at El Wak (El Uach), near the village of El Bura Haja, as a place where his green South African troops could taste their first blood. The post had been strafed and overrun by two companies of the King's African Rifles back in July. The Africans had started looting Italian supplies. After the Askaris regrouped from their initial panic of seeing an aircraft, they counterattacked. Only the British officers and NCOs were left to fight a rearguard action, though they had captured an Italian flag.

By October, El Wak was defended by the 73rd Colonial Battalion (20th Colonial Brigade) and one company of the 76th, as well as the 103rd 'Dubat' Group (literally, 'white turbans', semi-regular native Somali units) and one subgroup of the 8th Group. The command also mustered "Bernardelli's" Banda of native irregulars, supposedly to mustering 1,500 natives under an Italian Lieutenant (organized in five groups of 300 commanded by non-commissioned officers).

Fire support would be provided by one

## 'Using an Elephant Gun To Shoot A Hare' Somalia 16 December 1940

battery of the 20th Gruppi Campaign (65/17 Mountain Howitzer) and an unnamed 70/15 mountain howitzer battery, as well as a 77/28 Battery.

The positions were also surrounded by barbed wire and mines. By the time of the assault, the 92nd Brigade's HQ had taken up positions due East of the fort, along with elements (if not all) of its 191st Colonial Battalion.

The fort sat on one of four trails into Italian Somaliland, but the Juba section commander and Governor, LTG Gustavo Pesenti, hadn't visited the defenses for months. In August 1940, the El Uach sector commander had been LTC Giulio Aveta.

Godwin-Austen estimated that the post was defended by a three battalion Colonial Brigade, so he deliberately brought an overwhelming force to bear on the outpost (post-war claims place the Italian strength at only one battalion). Dingean's Day was chosen for the assault, since it had extreme emotional significance for the Boers. In 1838, Boer settlers annihilated a Zulu King's army

in revenge for a massacre of settlers.

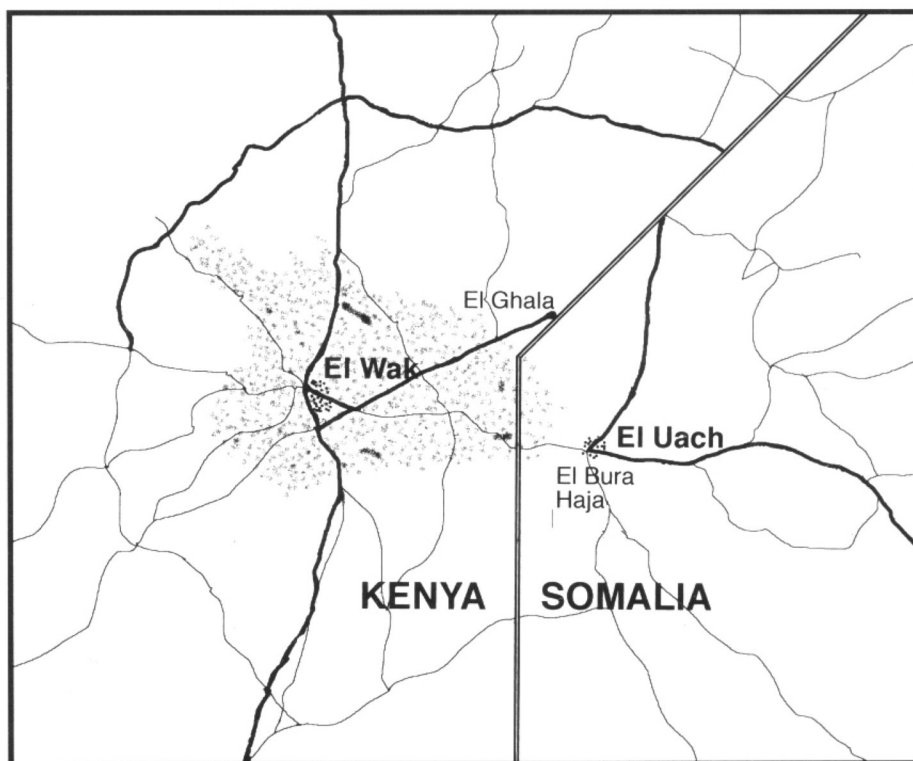
Moving north over 110 waterless miles from Wajir, Godwin-Austen took five and a half infantry battalions (1st South African Bgd, 24th Gold Coast Bgd less 2nd Bn, and two companies of 1/6th, King's African Rifles) as well as three artillery batteries, one tank and two armored car companies, and two sapper companies. He had four Hurricanes (#2 Sqd), three Junkers 86's (#12 Sqd), and nine Hartbeests (#40 Sqd) to provide air cover and support.

Godwin-Austen sent 'B' Column (Duke of Edinburgh's Own Regt., A Sqdn East Africa Armored Car Regt and the 4th Field Brigade, SAA north to British El Wak, just 6,000 yards from Italian El Uach. The column would then turn east to El Ghala, even closer to the Italian positions.

While this move would distract the defenders, 'A' column (1st SA and 24th Gold Coast Bgd's) would drive cross-country over the border and form a skirmish line with the South Africans to the east. The Gold Coasters would take the fort, the South Africans El Buro Hachi, 1,500 yards north east.

During the night of the 15th, the East Africa Force quietly took up staging area positions while their engineers cut a three-mile path for 'A' column and patrols made contact with the Somali Bandes. Probing Italian machine gun fire during the night apparently caused four lightly wounded and 'pinged' the tanks.

The fort had been reconnoitered before and sympathetic natives had reported the



Allied tanks, but apparently the Italian commanders didn't believe their own scouts.

At 06:05 hours, the tanks led the 24th to within 700 yards of Italian lines. They started taking machine gun and artillery fire. It wasn't until 08:15 that the four 3.7" howitzers of the 51st Gold Coast Light Artillery Battery began a fifteen minute barrage.

Deploying in two waves of six tanks each, they rushed forward. About twenty yards from the wire they turned broadside, like a naval maneuver, and raced back and forth along the wire raking the Italian positions. The Vicker's crews were close enough to see Askari gun crews manning their weapons. However, the light tanks were unable to penetrate the wire entanglements.

One tank stopped for technical problems and all of the Italian units concentrated their fire on it. While the armor wasn't penetrated and the crew suffered no casualties, the searchlight was smashed and the driver's prism shattered. Another Vickers was hit by a shell from a 70 or 65 mm and it's armor cracked, though it continued fighting<sup>1</sup>.

Meanwhile, the Gold Coaster's engineers brought forward their bangalore torpedoes. One fell short of the wire and while it's fuze was sputtering down, 2LT Ballenden of the Gold Coaster's ran forward to move it into position. Ballenden was a British Engineer officer only 'in-country' three weeks from England.

The men of the 24th followed with fixed bayonets as the temperature climbed to 106°F, while inside the armored cars and tanks it would broil to 150°.

Huts were torched and stronger buildings flattened by the tanks. An Italian Colonel (possibly the 92nd Brigade's LTC Degli Uomini) was found hiding in a mobile bakery's flour bin, covered in powdery white. Supposedly, the Gold Coaster's CO was touring the battlefield atop a Vicker's and had intended to burn this vehicle but decided to inspect it's interior first. With the tanks inside the wire, the Italian lines collapsed.

Two men stayed to fight, one was shot and the other bayoneted.

So fast was the Gold Coaster's victory that the tanks were bombed by Hartbeests of #40 Squadron while they were assisting the mop-up operation just south of the fort. Luckily there were no casualties.

At this point, South African forces claim that during the battle, two companies of 'Italians' were withdrawn, leaving the artillery undefended and the native troops unsupported. Considering that there were no units exclusively of European Italians, the withdrawal was probably of one of the two Colonial Battalions.

This might have actually been a reasonable 'attempt by the Italian commander to 'withdrawal while in contact,' a tricky maneuver for even well-trained forces but logical in the face of overwhelming enemy superiority. Leaving the Bande and Dubat to

cover the withdrawal was also tactically sound, as they normally would fade into the bush — in this case, where the South Africans could not easily follow<sup>2</sup>.

The Natal Carbineers and 1st Transvaal Scottish of the 1st SA Bgd were detailed to cut the retreat route to Bardera. At 1020 hours they were in assault position 400 yards south of the Italian lines. To their credit, the Askari's kept up a sharp fire from trenches, ammunition pits, foxholes and huts while the South Africans closed with bayonets.

Two Schwarzlose medium machine guns pinning down the Natal Carbineers were taken when Bren-gunner CPL Frank Foxon leapt up and began the final 150 yard charge across open brush. Behind a barrage of mortar and 18 lbr fire, they dug the native troops out.

While draining abandoned Italian canteens, the South Africans found fifty-five dead Askaris, including a sniper in a tree.

Special Order No. 749/G

19 December 1940

12th African Division to 1st S.A. Light Tank Company:

Officer Commanding

1st M.F., (S.A.) Light Tank Company

1. Will you please accept my personal thanks and convey to all ranks under your command my deep appreciation of, and admiration for, their brilliant work in the El Wak operations.

2. High efficiency was required to reach the battlefield over such bad roads, but this efficiency was surpassed in battle, and you have won the admiration of all.

3. Though I shall sorely miss you all, I am glad to know of your early departure for a well deserved rest and refit. You have done well throughout your period under my command, and I look forward eagerly to the day when I may be so lucky as to have you with me again.

GODWIN AUSTEN

Major-General

Commander 12th (African) Division Headquarters

12 (A) Division

19th Dec. 40

## What's Canada's Best Kept Military Secret?

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The 191st's flag and the 92nd Brigade HQ where taken and the inexperienced soldiers started looting the Italian military and food stores. Apparently, they were better supplied than the Springboks.

Total Italian losses were forty-four captured (twenty of them Italians, including the LTC), eight officers and 200 colonials killed, two medium and two light machine guns, twelve guns and a radio station taken.<sup>3</sup> The British claimed the Italian Brigade Commander escaped on a mule, to which the Duke of Aosta (Italian Commander of East Africa) incredulously questioned why, when an automobile was available.

The South Africans lost two dead when a shell exploded in a headquarter's area, while there were a dozen wounded — most of them Gold Coasters. The tank company technical officer was bruised by a spent bullet, some 500 yards behind the battle lines.

## POST SCRIPT

Allied moral in East Africa Force soared from the victory and the practical experience of a combined arms effort. The euphoria was to stay with them as they drove up the Somali coast, taking objectives and driving the Italian forces before them. General Pesenti recommended to Addis Ababa an immediate armistice followed by a surrender of all of Italian East Africa. Aosta promptly sacked him and sent General Carlo De Simone (who had successfully taken British Somaliland back in August) as his replacement.

The Italians, poised on the Kenyan border for months but overestimating their enemy's strength, had lost any opportunity to drive on Nairobi.

The next morning the Allied column was still laagered up in the vicinity of El Wak, while the ruins burned. Before dawn three Italian Savoia bombers struck the area of the fort and the troops returned fire with rifles and Bren guns. The South African column suffered no damage from that raid, or the next.

The next morning a Caproni 133 attempted another raid while the East Africa Force was headed back to Wajir. A Hartbeest (flow by CPT C.M.S. Gardner, 40th Cooperation Sqd) downed the bomber. The crew managed to walk away from the wreck, leaving the wounded copilot and a gunner, and make Italian lines two days later.

In the January 1998 issue, Adam Geibel will profile the Vickers Mk III in South African service including photographs and drawings.

## END NOTES

1. Light antitank weapons were nonexistent in the AOI Order of Battle. While 8 mm Schwarzlose machine guns might score the occasional lucky hit, in general the Vicker's Mk III was impervious to small arms caliber weapons.

According to Italian records consulted, no 20 mm Solothurn anti-tank rifles had been shipped to AOI and all of the captured Polish rifles were all sent to the Eastern front. The next best solution would have been the crew-served 20 mm Breda M35 AA/AT Gun, but none of these weapons had been sent up to El Wak.

Furthermore, the use of Molotov cocktails — a Limited Standard Issue item in the Italian Army — was also nonexistent in this theater. This left only the 65/17 mountain howitzers to deal with armor.

2. When first confronted, Askari reaction to modern machines was awe — whether aircraft or armor. They labeled the Marmon-Herringtons "Rhino Car's" and since those bore a fleeting resemblance to trucks, one can only imagine what their reaction to tanks must have been.

3. Apparently, one four-gun battery might have managed to withdraw — most likely the 77/28 unit. Original SA sources claim 13-16 guns captured.

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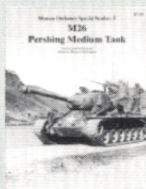
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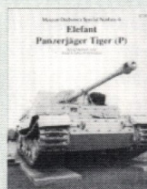
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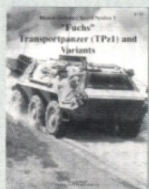
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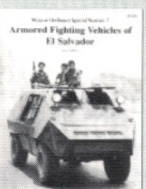
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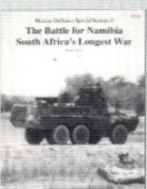
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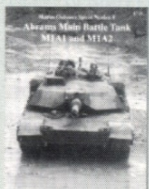
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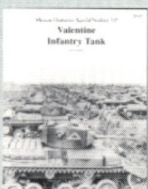
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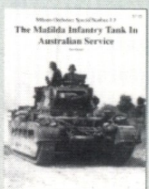
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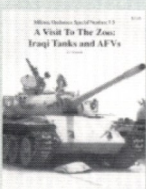
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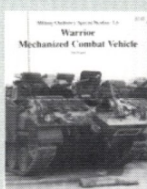
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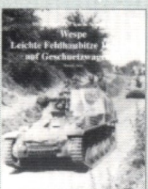
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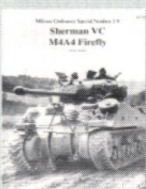
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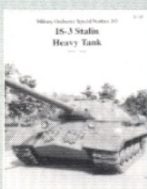
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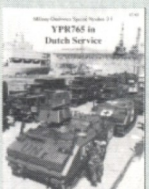
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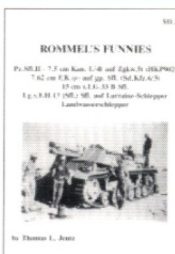
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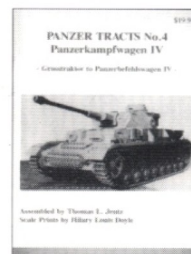
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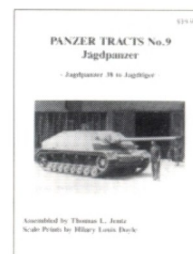
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# Historic

## APG Ordnance Museum Begins Artifact Restoration Program

# Restoration

by  
Stephen 'Cookie' Sewell

*It was reputedly Commodore Vanderbilt who, when asked how much the upkeep on his yacht ran yearly, replied "If you have to ask how much it costs to run one then you can't afford it." The same is pretty much true with museums — if you have to ask what the budget requires every year to preserve and restore the artifacts which it conserves, then you probably can't afford to keep any of them yourself.*

*The T-34 Model 1942 after the sheet steel was stripped and the engine deck dismantled. Rust is prevalent throughout the inside as well as the outside of the tank.*

This has been sadly true for many years in the case of the US Army Ordnance Museum, which has had a very hard time of preserving its larger artifacts (the tanks and artillery pieces in the Foreign Armor Park and along Maryland Avenue), let alone give thought to restoration of a rapidly deteriorating group of rare items. Some of the items have gone to other museums in the US Army museum system, such as the Tiger II going to Fort Knox and the Patton Museum, in that they had better budgets or better facilities to restore the vehicles. Others, like the controversial decision to permit the Tiger I to return to Germany for five years in return for rebuilding it and fixing some of its problems, have not worked out as well. Still, any artifacts which are preserved by someone else are still items which have been preserved and not rotting due to lack of funds or care.

In an age of falling budgets, manpower cutbacks, and an unhappy general lack of interest in the preservation of military history by the American public, it seemed as if this tragedy would continue unabated. However, with the dawn of "political correctness" and "green movements," new hope for the Aberdeen collection has surfaced from an unexpected quarter: the US Environmental Protection Agency (EPA).

Tests by the EPA on the Foreign Armor Park at APG revealed that it has one of the

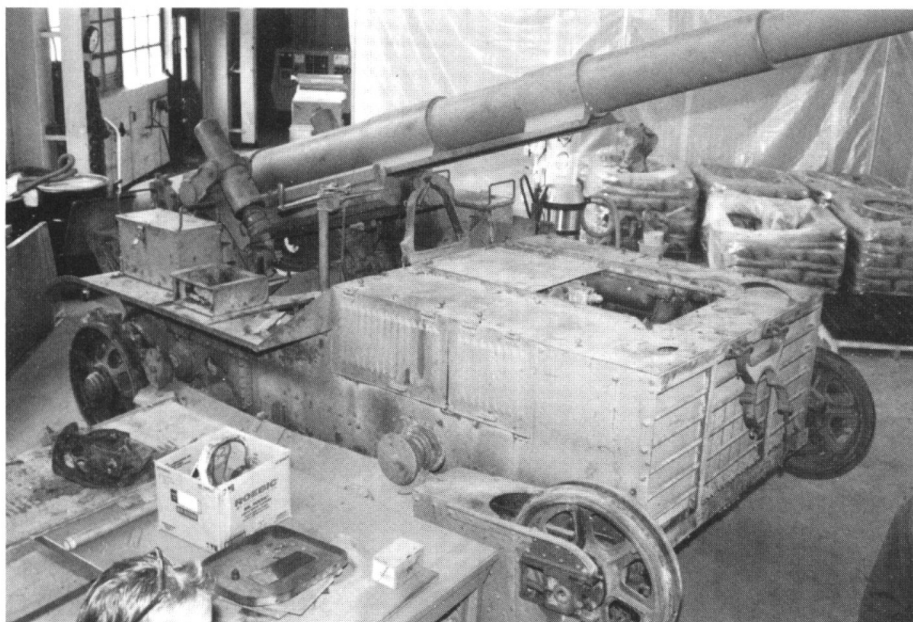
most contaminated sections of soil in the US based on the number of heavy metals and other contaminants which have leached into the soil. These come from the paints and lubricants in the vehicles, which after nearly 50 years in the same area have proceeded to literally "bleed" their colors and life's blood into Maryland. Since APG (both Aberdeen and Edgewood areas) has been designated as a "Superfund" site, the EPA is interested in stopping or reversing any such trends to prevent contamination of ground water, outlying soil, and human habitation.

The result is a program in which all should benefit. Over the next eight years (1996-2004) the EPA will provide \$8 million from the "Superfund" to clean up, sanitize, and restore a number of the worst culprits (from the EPA's point of view, leakers and leachers) to acceptable hazard levels. As many vehicles as possible will go through the program, and there are a number of advantages to this.

First off, APG will get many seriously deteriorated artifacts stabilized (no more rusting) and preserved without extreme measures. Up until now, leakers were only dealt with by pulling all possible sources of contamination from the vehicles — engines, transmissions, final drives, and fuel tanks — which ruined them as artifacts. Second, badly eroded paint jobs and decades of neglect and mistakes will be corrected by providing more accurate representations of the vehicles as when they were in service. This gets rid of a number of well-meaning but terrible paint jobs — one past museum director having gone so far as to "color code" exhibits by country without regard to original paint scheme — as well as the EPA's source of much of the heavy metal contamination, lead based primers and paints. Third, artifacts will be cleaned up to the point of being able to read serial numbers and factory markings, which many historians have bemoaned for years with the APG collection. After 20 or 30 coats of paint, it has been impossible to tell if an artifact was original, rebuilt, or even which country built some of them.







*The M1920 4.7" SP Gun. This vehicle is the last of its kind, and the forefather of the later M12 "King Kong" and M40 "Big Shot" SP 155mm guns. Surprisingly, the upper works appear to be in pretty good shape.*

All of this does have a price, and at the moment, once an artifact is restored, it will be sent to a warehouse for storage until the new Museum building is completed to house them. Thus, once one of the "favorites" disappears, it will not return to display. The first six items which are now in the process of going through stabilization and renovation are: the US M1920 4.7" self-propelled gun; the Soviet T-34 Model 1942; one of the M-1938-43 120mm Soviet mortars; the British Cruiser Tank Mk VI Crusader III; the Iraqi T-72 tank; and the East German BMP-2. The choice of the mortar was based on the fact that the museum had two, and they really only needed a good cleaning to test the concept; the rest were selected as the worst leakers (the T-72 and BMP-2 in particular, as they have PCB-containing lubricants and fuels onboard) or were responsible for the worst heavy metal leeching.

The EPA contract for the process went to the Fred L. Hawkins Company of Harve de Grace, Maryland, and the USAOC&S provided Building 5045 as the site for the restoration process. The building was configured to comply with both EPA and Occupational Health and Safety Administration (OSHA) standards. The project is under the direction of Mr. Pat Hinchy, vice president of the Hawkins Company, and Mr. Alan Killinger of the Museum staff is the coordinator for the project. Actual work on the restoration is being carried out by Tim Jordan, Jeff Jordan, Joe Wheeler, and Tab Hinchy, under the supervision of Dale Innerst.

The procedure works in this manner. An

artifact selected by the EPA for decontamination and stabilization is brought to the facility. Upon arrival, the vehicle is carefully opened up and any anti-vandalism welding is removed to allow access to the interior of the vehicle. The fluids are tested and removed in the proper EPA manner — PCB fluids are handled as contaminants, whereas non-PCB fluids are simply removed and sent out for recycling as with other petroleum-based products. Once the fluids have been removed or drained, the vehicle is disassembled as much as is practical to prepare it for stripping and decontamination. Photographs and drawings

are made at each step of the way to ensure that parts will be properly reassembled when the restoration is complete. The parts which are to be kept and reassembled are then stripped.

The actual stripping is performed in an overpressure situation inside a giant plastic tent, which prevents particulate matter from escaping into the environment. The method used involves getting a worker into a "space suit" and entering the overpressure facility, where he then uses a very high pressure sprayer to strip off the paint. The mixture used is essentially water with an abrasive made from 80% baking soda and 20% aluminum oxide. This mixture is both EPA approved (unlike sandblasting or use of carborundum particles) and extremely effective. It also shows that it can strip paint from glass objects (viewports and headlights) without scratching them. An area of approximately four square feet can be cleaned in a matter of about 15 minutes, and this combination cleans down to bare metal, with little regard as to paint thickness. This also "cleans the wound" by stripping off any layers of oxidized metal (rust) so that once cleaned and properly repainted, there will not be a problem with rust eatback through the new coat of paint.

The overpressure situation in the tent tends to force the particulate matter out of the air and into a drainage system, which is then pumped clear by a special filter and settling tank system. The particulate matter is extracted for proper disposal, and the purified water is then pumped into the post sewage system. Once the vehicle is cleaned to the bare metal in this fashion, restoration begins.

The restoration facility has a very com-



*The Iraqi T-72. The engine had already been removed from this vehicle as it was PCB contaminated, so the tank is basically only a superficial restoration.*



plete workshop with tools, stock, and equipment, and the goal is to fully complete at least the external forms of each artifact to their original condition. For example, the M1920 has a sheet steel belly pan which has been totally consumed by rust. This will be measured and a completely new one, with modern priming and rustproofing, will be made and installed to replace it. Vehicles will not be restored to "running" condition, but will be stabilized to prevent further damage.

The T-34 Model 1942 is a special case. This vehicle was a gift to the US Army in 1942 from the Soviet government, and was provided for comparative testing in response to Lend Lease weapons shipments. It arrived with a KV-1 which is also in the Museum's collection, and after testing, both tanks were sent to the embryonic Museum for display. However, in 1947 the Museum staff cut the tank open to display its interior, thus ruining its integrity and permitting the vehicle to begin to deteriorate. While the tank was kept inside for about ten years, this was not a problem, but when the Museum placed its tanks outside, it began to decay. Even tack welding sheet steel panels to the sides of the tank did not protect its interior, and the inside of the vehicle suffers badly from rust.

Once the restoration process is complete, this tank will have plexiglas sides attached to it and lights placed in its interior, as the Tiger II (which had the same problem)



*The Crusader III. Peter Brown, former editor of the Tracklink (the house organ of the Friends of the Tank Museum in Bovington) forwarded 150 sharp clear photos and xeroxed pages from the operator's manual from the Tank Museum's Crusader III which will be used to restore this tank.*

now does at Fort Knox. Arguably a significant vehicle, it is nice to know that this tank too will be preserved for future Museum visitors to enjoy rather than to simply rot in place for several more years.

As was noted before, in a day and age of shrinking dollars and deteriorating vehicles, museums have to become more creative in

preserving their artifacts. Aberdeen has been given a golden chance to do that — a "sugar daddy", so to speak — and unlike some others, has gladly accepted a partner in preserving and restoring its priceless artifacts. Were that others could be so grateful, and perceptive of the chance to fix errors while they still can.

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# GAU-19/A

## *The Firepower Advantage*

### A Lightweight .50 Caliber Gun

By

JEFF MCKAUGHAN

The Gatling Gun, and the principles that it utilizes, have been around since its first introduction in 1862. Falling in and out of grace it was in recent times, usually in 20 or 30 mm form, that it has found its way back into military inventories — mostly in aviation.

General Dynamics Armament Systems, has a .50 caliber weapon, based on the Gatling principles, that has been demonstrated in applications for air, land, and sea. The GAU-19/A is an externally-powered, three-barrel, rotary-action mechanism that can deliver up to 2,000 rounds per minute. It is capable of turning helicopters into formidable weapons platforms, and can be mounted on virtually any type of large, or small, naval craft.

The GAU-19A has also been mounted on light soft-skinned vehicles including Special Operations vehicles, Land Rovers, and the HMMWV. Its lightweight, only 76 pounds, means that it has wide-ranging applications on just about any vehicle. The GAU-19A can fire armor-piercing incendiary (API), armor-piercing incendiary tracer (APIT), tracer, ball, sabot launched armor piercing (SLAP), and sabot launched armor piercing tracer.

The weapon can put an overwhelming amount of firepower on target and has a low recoil resulting from the rotation of the barrels and the high rate of fire. Another benefit of the barrel rotation is longer bursts since each barrel fires once and rotates

twice allowing some time to cool and thus reduce the amount of heat retained in the barrel.



The small size of the mechanism itself, only 46.5 inches long mean that it can also be mounted as close-in protection on heavier AFVs and vehicles. The gun's performance and its staggering rate of fire is sufficient to cause local threats to "go-to-ground," or simply eliminate them.

As with the Gatling Gun of old, the limitation of the gun was not with gun itself but its heavy ammunition consumption. The target suppression ability, its killing power, reliability, and the fact that it fires three times the ammunition for less than the cost of 1,000 rounds of 20mm ammunition, are facts, however, choosing the right platform capable of carrying the multi-purposed GAU-19/A is the critical decision. If chosen properly, the GAU-19/A is a battlefield controller.

*The .50 caliber GAU-19/A mechanism and ammunition belt (about 1.4 seconds worth!)*



# Zuzana . . .

## *Dana's 155 mm Sister*

By  
Jeffrey McKaughan

In the late 1970s, the Czechoslovakian Army had an open requirement for a self-propelled artillery system. After surveying the existing systems, it was decided to proceed with an indigenously developed and manufactured system.

Building on their extraordinarily well-built Tatra 815 8 x 8 truck, a wheeled system mounting a 152 mm gun was designed. Mounting the gun in a fully-traversable armored turret, the system took advantages from its long history of heavy truck manufacturing to speed the design process. After a successful testing period, the system, designated vzor 77 self-propelled howitzer Dana, was accepted into the Czechoslovakian Army in 1981.

Enjoying only limited success in the export market with sales to some of the former Russian states, Libya, and Poland, a replacement for Dana was sought. ZTS (Závody tazkého strojárstva) publicly admitted in 1991 that it was proceeding with plans to develop a 155 mm version of the same system.

The prototype was rolled out in 1993. Still based on the rock-solid Tatra 815 truck chassis, it is difficult to distinguish the Dana from its newer 155 mm sister—Zuzana. The chassis and turrets are similar although upon careful examination, the differences become more apparent and noticeable.



*The standard Zuzana 155 mm self-propelled howitzer.*



*The Zuzana T-72 (M1) A40 155 mm self-propelled howitzer.*

With the Czech and Slovak republics going their separate ways, ZTS found itself in Slovakia, now with a smaller army (and therefore smaller domestic market) to sell the Zuzana to.

After a rather long (and I'm sure anxious) period, the Slovak Army recently announced the launch order for the Zuzana by ordering eight systems (one battery). The system has been designated Howitzer Model 2000.

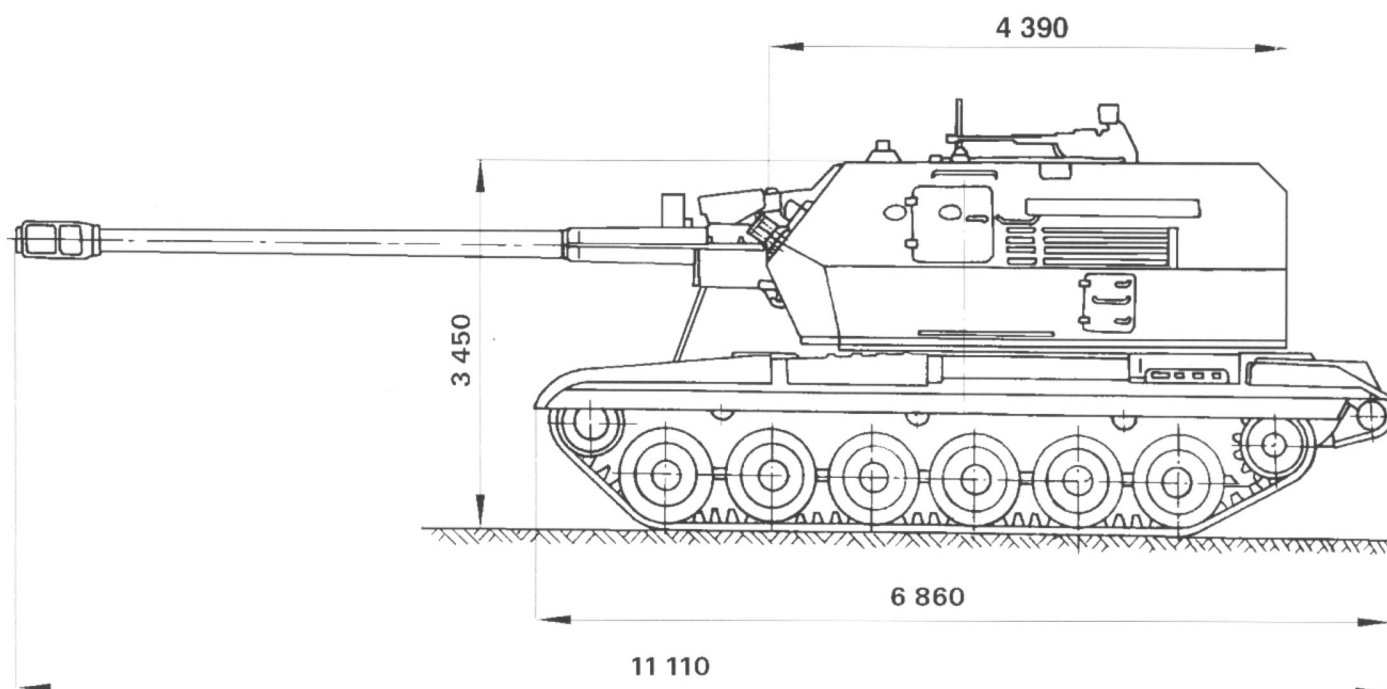
An interesting note is that while it has been touted as an important leap for a former eastern bloc country to develop a NATO-standard 155 mm system, it is not necessarily so. While the 155 mm is the NATO standard, the 45 caliber is certainly not.

In an attempt to capitalize on the technology that was put into the Zuzana (8 x 8), ZTS has redesigned the turret

itself and the turret ring to make it compatible with the T-72M1. The effort is a private venture aimed primarily at the export market.

Since the turret houses all of the ordnance, fire control, and crew for artillery operations, the automotive mount is only governed by whether the chassis is heavy enough to withstand the shock of firing and has enough power to keep up with the front line. The British, French, and South Africans have done similar prototype conversions with their current self-propelled gun turrets.

The turret is very similar in shape to the 8 x 8 version, and at least one brochure carried photos that made the turret look much more alike while several others showed some marked differences. However, as the vehicle has only recently been purchased (the wheeled version) meaning that of that date, only prototypes existed, it is very possible that several vehicles, each with slight changes are currently running around. Suffice it to say that 8 x 8 and tank turrets share more similarities than differences.



Zuzana T-72 A 40, as it is designated, has the same autoloading system as the wheeled variant. Maximum range is about 39.5 km with a minimum range of just under 6 km. The range of main gun elevation is from  $-3.5^{\circ}$  to  $+70^{\circ}$ . Maximum range (at a  $45^{\circ}$  elevation) is 39.6 km

While the turret has full traverse capability it is not clear whether the gun can be fired from any position. As there are no stabilization jacks, it would appear unlikely

that in anything other than emergency situations, the gun would fire over the forward arc of the vehicle.

The 155 mm ammunition (as in the 152 mm earlier version) is autoloaded although the ammunition handler must set the fuzes manually. Rate of fire is about six rounds per minute, meaning that the Zuzana can fire from its onboard supply for just under seven minutes before exhausting its forty round supply. During the first minute, Zuzana can deliver a burst rate of six rounds.

The large actuating mechanism above

the main gun is part of the autoloading system and contains the chain-driven arm that loads the round into the breech.

There is a 12.7 mm NSV machine gun mounted above the right turret housing. The crew also has access to personal weapons stored inside the vehicle. There are two banks of three smoke launchers, one each on the outside forward edge of the turret.

Manned by a crew of four, the driver sits in the chassis section, with the ammunition handler in the right side of the turret. The gunner and loader are situated in the left

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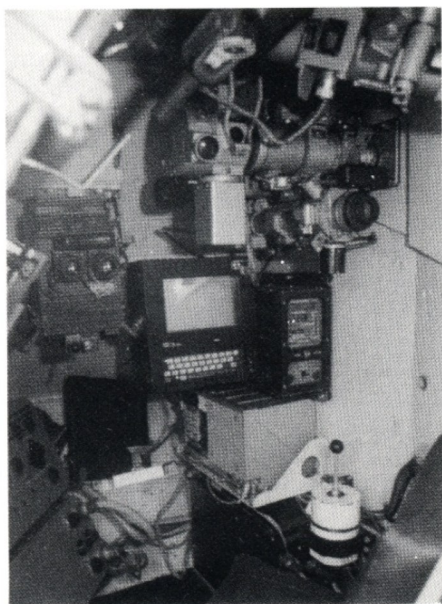
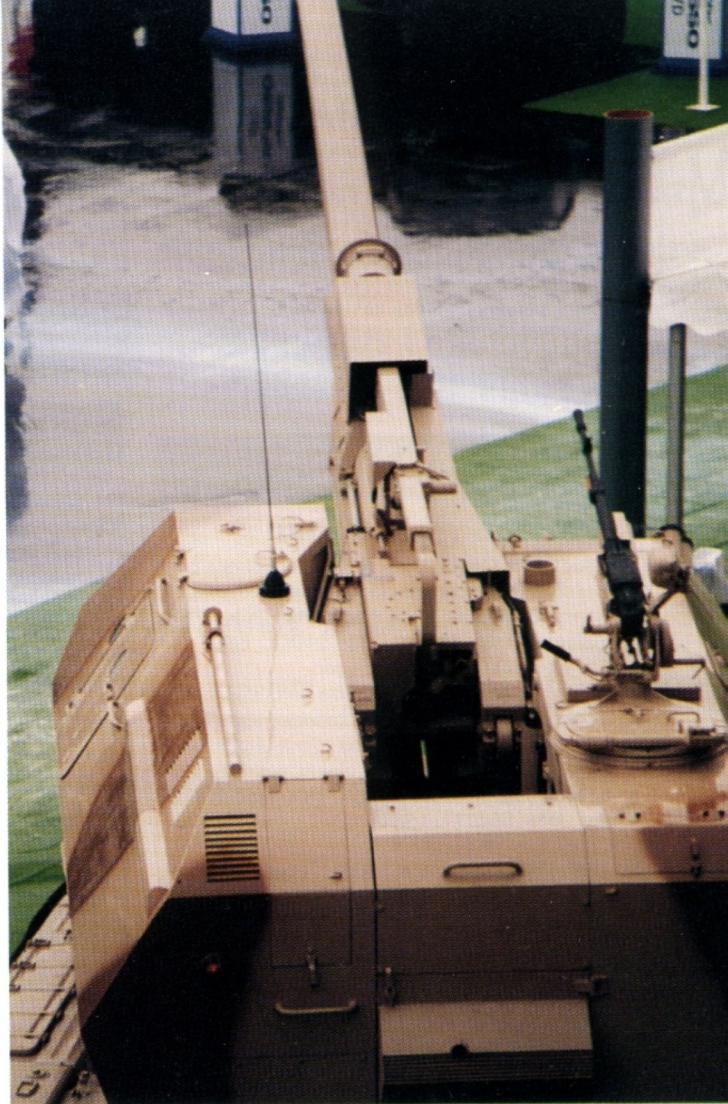
*The Tatravan 6 x 6 artillery fire control system.*

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Based on company literature at least four Zuzana T-72 (M1) A40 vehicles have been built. It is not known if there have been any serious discussions with customers interested in acquiring the system, or purchasing the turrets for their own conversions.

*From this view the two separate turret housing with the main gun in the center opening is apparent.*



*The gunner's position forward in the left-hand turret housing.*





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**GERARD VAN OOSBREE**  
European Correspondent

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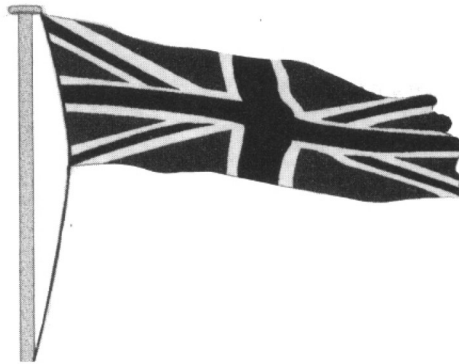


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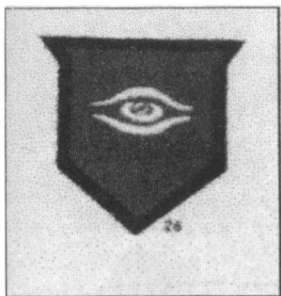
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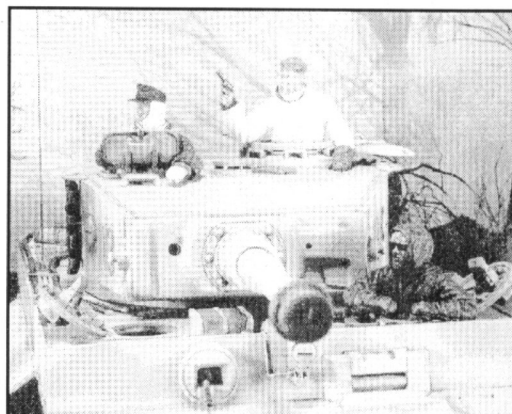
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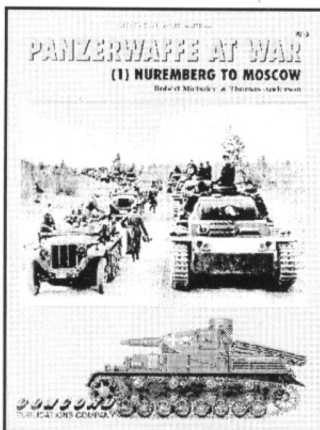
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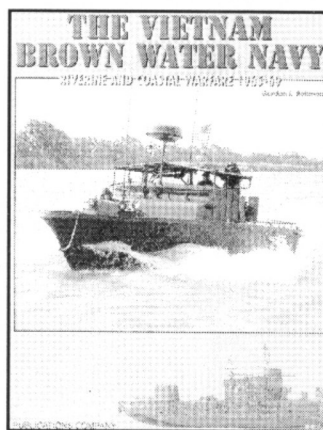


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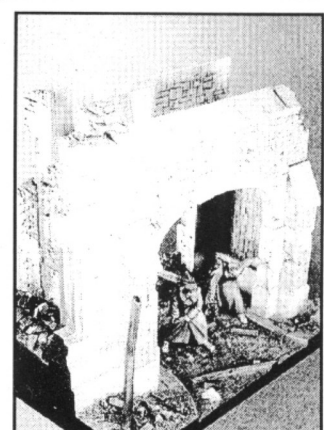
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